

General

Title

Optimizing patient exposure to ionizing radiation: percentage of CT imaging reports for all patients, regardless of age, with the imaging study named according to a standardized nomenclature and the standardized nomenclature is used in institution's computer systems.

Source(s)

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPI®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Structure

Secondary Measure Domain

Clinical Quality Measure: Process

Brief Abstract

Description

This measure is used to assess the percentage of computed tomography (CT) imaging reports for all patients, regardless of age, with the imaging study named according to a standardized nomenclature* and the standardized nomenclature is used in institution's computer systems, including but not limited to:

- Computerized physician ordering system
- Charge master
- Radiology information system
- Electronic health record

*Use of a standardized nomenclature is meant to enable reporting to a Dose Index Registry. There is no standard lexicon implemented across the board for naming CT exam procedures. To make like comparisons of sites reporting dose index data to a registry, it is necessary to use a specific CT exam name and standardize that across registry participants.

Rationale

Promoting Effective Communication and Coordination of Care is one of the priorities in the *National Strategy for Quality Improvement in Health Care*, with great potential for rapidly improving health outcomes and increasing the effectiveness of care for all populations (Agency for Healthcare Research and Quality [AHRQ], 2011).

A uniform structure for capturing, indexing, and retrieving a variety of radiology information may facilitate the structured reporting of radiology reports. This will also permit mining of data for participation in research projects, registries, and quality improvement efforts (Kundu et al., 2009).

Standardized nomenclature may include RadLex®. Other standardized nomenclature may be available and would be acceptable for this measure. RadLex® is a controlled terminology for radiology—a single unified source of radiology terms that is designed to fill this need. The purpose of RadLex® is to provide a uniform structure for capturing, indexing, and retrieving a variety of radiology information sources, such as teaching files and research data. This may facilitate a first step toward structured reporting of radiology reports. This will also permit mining of data for participation in research projects, registries, patient outcomes and quality assurance (Langlotz, 2006).

The following evidence statements are quoted verbatim from the referenced clinical guidelines and/or other references:

The Lexicon-Enabled Radiology Practice (Radiological Society of North America [RSNA], 2009).

As images, imaging reports and medical records move online, radiologists need a unified language to organize and retrieve them. Radiologists currently use a variety of terminologies and standards, but no single lexicon serves all of their needs.

The existence of a standardized lexicon for radiology enables numerous improvements in the clinical practice of radiology, starting with the ordering of imaging exams, through the use of information in the resulting radiology report. It also makes possible more effective reuse of information for research and educational purposes. Some specific uses of RadLex® terminology include:

Automatic order entry decision support. Because the names of imaging exams are described in consistent language, the applicability of appropriateness criteria developed by the American College of Radiology (ACR) and others can be determined automatically.

Vendor independent "protocoling" of complex imaging exams. Imaging exam protocols for computed tomography (CT) and magnetic resonance (MR) exams can be specified using vendor independent language. Consistent names for imaging exams and procedure steps (e.g., radiographic view, CT sequence, MR series) are used throughout the radiology practice.

Improved speech recognition accuracy. Because the exam descriptions are explicitly linked to the body site imaged and the modality used, speech recognition systems use this linkage information to improve recognition accuracy.

Real-time decision support for the radiologist. Because standardized terms are associated with radiology reports, these terms can trigger decision support tools for the radiologist. Decision support systems automatically retrieve case-relevant information in real time, such as checklists for image features to seek, additional differential diagnoses, or information from PubMed, the Internet, and proprietary decision support databases.

Evidence for Rationale

Agency for Healthcare Research and Quality (AHRQ). 2011 report to Congress: national strategy for quality improvement in health care. [internet]. Washington (DC): U.S. Department of Health and Human Services; 2011 Mar [accessed 2012 Jun 21].

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician

Consortium for Performance Improvement® (PCPI®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

Kundu S, Itkin M, Gervais DA, Krishnamurthy VN, Wallace MJ, Cardella JF, Rubin DL, Langlotz CP. The IR RadLex project: an interventional radiology lexicon--a collaborative project of the Radiological Society of North America and the Society of Interventional Radiology. J Vasc Interv Radiol. 2009 Apr;20(4):433-5. [PubMed](#)

Langlotz CP. RadLex: a new method for indexing online educational materials. Radiographics. 2006 Nov-Dec;26(6):1595-7. [PubMed](#)

Radiological Society of North America (RSNA). RadLex in your practice. [internet]. Oak Brook (IL): Radiological Society of North America (RSNA); 2009 [accessed 2012 Jun 11].

Primary Health Components

Ionizing radiation; computed tomography (CT); imaging study standardized nomenclature; RadLex®

Denominator Description

All computed tomography (CT) imaging reports for all patients, regardless of age

Numerator Description

Computed tomography (CT) imaging reports with the imaging study named according to a standardized nomenclature and the standardized nomenclature is used in institution's computer systems, including but not limited to:

- Computerized physician ordering system
- Charge master
- Radiology information system
- Electronic health record

See the related "Numerator Inclusions/Exclusions" field.

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Importance of Topic

The use of medical imaging has resulted in revolutionary advances in the practice of medicine. The increased sophistication and clinical efficacy of imaging have resulted in its considerable growth.

Consequently, the evolution of imaging has resulted in a significant increase in the population's cumulative exposure to ionizing radiation and a potential increase in adverse effects including cancer (Amis, Butler, & American College of Radiology [ACR], 2010; Amis et al., 2007). Although experts may not agree on the extent of the risks of cancer from medical imaging, there is uniform agreement that care should be taken to weigh the medical necessity of a given level of radiation exposure against the risks, and that steps should be taken to eliminate avoidable exposure to radiation (Amis et al., 2007; Center for Devices and Radiological Health [CDRH], 2010).

High Impact Topic Area

This topic was chosen for measure development because of the high costs associated with imaging studies and because these medical procedures are a significant source of radiation exposure. The following objective data support the degree of increase in the use of imaging studies and emphasize the importance in taking steps to help eliminate avoidable exposure.

Prevalence and Incidence

The average per capita exposure to ionizing radiation from imaging exams increased by about 600% from 1980 to 2006 in the United States (U.S.) (Mettler et al., 2009; National Council on Radiation Protection and Measurements [NCRP], 2009).

The largest contributor to this dramatic increase in population radiation exposure is computed tomography (CT). In 1980 fewer than 3 million CT scans were performed; in 2006, there were about 380 million radiologic procedures (including 67 million CT scans) and 18 million nuclear medicine procedures performed in the U.S. (Mettler et al., 2009).

The imaging study with the single highest radiation burden, accounting for 22% of cumulative effective dose, is myocardial perfusion imaging (Fazel et al., 2009).

In 2006, an estimated 19 million head, 10.6 million chest and 21.2 million abdominal and pelvic CT scans were performed accounting for 28%, 15.9%, and 31.7%, respectively, of the total number of CT scans in the U.S. (Mettler et al., 2009).

Currently, approximately 11% of CT examinations are performed on children, which could account for more than 7 million pediatric CT examinations per year in the U.S. (Mettler et al., 2000; Frush & Applegate, 2004; Linton, Mettler, & NCRP, 2003).

The prevalence of CT or magnetic resonance imaging (MRI) use during emergency department (ED) visits for injury-related conditions increased from 6% in 1998 to 15% in 2007 (Korley, Pham, & Kirsch, 2010).

While CT utilization has decreased steadily since 2003 in pediatric facilities across North America (Townsend et al., 2010) the use of CT in children who visit the ED increased from 0.33 to 1.65 from 1995 to 2008 and occurred primarily at non-pediatric focused facilities (Larson et al., 2011).

Costs

From 2000 through 2006, total Medicare expenditures for physician imaging services increased from \$6.7 billion to about \$14 billion, an increase of 13% per year on average (U.S. Government Accountability Office [GAO], 2008).

In 2005 imaging services represented an estimated 14% of 2005 spending included in the sustainable growth rate (SGR) calculation, but represented 27% of the total increase in such spending between 2004 and 2005. The majority of the growth occurred for advanced imaging (GAO, 2008).

In 2006, advanced imaging, including CT and MRI, accounted for 54% of total Medicare imaging expenditures, up from 43% in 2000. This translates to an increase in Medicare spending on advanced imaging from about \$3 billion in 2000 to about \$7.6 billion in 2006 (GAO, 2008).

Disparities

There is variation according to age, sex, and health care market in the proportion and mean dose of patients undergoing medical imaging procedures. One study concluded that the proportion of subjects undergoing at least one imaging procedure was higher in older patients, rising from 49.5% of those who were 18 to 34 years old to 85.9% of those who were 60 to 64 years old. The study also found that women

underwent procedures significantly more often than men, with a total of 78.7% of women undergoing at least one procedure during the study period, as compared with 57.9% of men (Fazel et al., 2009).

Opportunity for Improvement

One retrospective cross-sectional study describing radiation dose associated with some of the most common types of diagnostic CT found variable radiation doses. The study found variability in the following exams: 1) routine chest exam without contrast, the CT effective doses ranged from 2 mSv to 24 mSv; 2) routine abdomen-pelvis, no contrast - CT effective dose ranged from 3 mSv to 43 mSv; 3) routine head exam - CT effective dose ranging from 0.3 mSv to 6 mSv (Smith-Bindman et al., 2009).

Radiologists currently use a variety of terminologies and standards, but no single lexicon serves all of their needs (Kundu et al., 2008). Terminology is increasingly vital to the practice of medicine. Many of the benefits of clinical information technology cannot be realized unless information is stored using standard terms in a structured format (Kundu et al., 2009; Kahn et al., 2009).

Evidence for Additional Information Supporting Need for the Measure

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPIA®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

Amis ES Jr, Butler PF, American College of Radiology. ACR white paper on radiation dose in medicine: three years later. J Am Coll Radiol. 2010 Nov;7(11):865-70. [PubMed](#)

Amis ES Jr, Butler PF, Applegate KE, Birnbaum SB, Brateman LF, Hevezi JM, Mettler FA, Morin RL, Pentecost MJ, Smith GG, Strauss KJ, Zeman RK, American College of Radiology. American College of Radiology white paper on radiation dose in medicine. J Am Coll Radiol. 2007 May;4(5):272-84. [PubMed](#)

Center for Devices and Radiological Health (CDRH). Initiative to reduce unnecessary radiation exposure from medical imaging. Silver Spring (MD): U.S. Food and Drug Administration, Center for Devices and Radiological Health; 2010 Feb. 12 p.

Fazel R, Krumholz HM, Wang Y, Ross JS, Chen J, Ting HH, Shah ND, Nasir K, Einstein AJ, Nallamothu BK. Exposure to low-dose ionizing radiation from medical imaging procedures. N Engl J Med. 2009 Aug 27;361(9):849-57.

Frush DP, Applegate K. Computed tomography and radiation: understanding the issues. J Am Coll Radiol. 2004 Feb;1(2):113-9. [PubMed](#)

Kahn CE, Langlotz CP, Burnside ES, Carrino JA, Channin DS, Hovsepian DM, Rubin DL. Toward best practices in radiology reporting. Radiology. 2009 Sep;252(3):852-6. [PubMed](#)

Korley FK, Pham JC, Kirsch TD. Use of advanced radiology during visits to US emergency departments for injury-related conditions, 1998-2007. JAMA. 2010 Oct 6;304(13):1465-71. [PubMed](#)

Kundu S, Itkin M, Gervais DA, Krishnamurthy VN, Wallace MJ, Cardella JF, Rubin DL, Langlotz CP. The IR RadLex project: an interventional radiology lexicon--a collaborative project of the Radiological Society of North America and the Society of Interventional Radiology. J Vasc Interv Radiol. 2009 Apr;20(4):433-5. [PubMed](#)

Larson DB, Johnson LW, Schnell BM, Goske MJ, Salisbury SR, Forman HP. Rising use of CT in child visits to the emergency department in the United States, 1995-2008. Radiology. 2011 Jun;259(3):793-801. [PubMed](#)

Linton OW, Mettler FA, National Council on Radiation Protection and Measurements. National conference on dose reduction in CT, with an emphasis on pediatric patients. *AJR Am J Roentgenol*. 2003 Aug;181(2):321-9. [PubMed](#)

Mettler FA Jr, Wiest PW, Locken JA, Kelsey CA. CT scanning: patterns of use and dose. *J Radiol Prot*. 2000 Dec;20(4):353-9. [PubMed](#)

Mettler FA, Bhargavan M, Faulkner K, Gilley DB, Gray JE, Ibbott GS, Lipoti JA, Mahesh M, McCrohan JL, Stabin MG, Thomadsen BR, Yoshizumi TT. Radiologic and nuclear medicine studies in the United States and worldwide: frequency, radiation dose, and comparison with other radiation sources--1950-2007. *Radiology*. 2009 Nov;253(2):520-31. [PubMed](#)

National Council on Radiation Protection and Measurement (NCRP). Ionizing radiation exposure of the population of the United States. Bethesda (MD): National Council on Radiation Protection and Measurement (NCRP); 2009.

Smith-Bindman R, Lipson J, Marcus R, Kim KP, Mahesh M, Gould R, Berrington de Gonzalez A, Miglioretti DL. Radiation dose associated with common computed tomography examinations and the associated lifetime attributable risk of cancer. *Arch Intern Med*. 2009 Dec 14;169(22):2078-86.

Townsend BA, Callahan MJ, Zurakowski D, Taylor GA. Has pediatric CT at children's hospitals reached its peak?. *AJR Am J Roentgenol*. 2010 May;194(5):1194-6. [PubMed](#)

U.S. Government Accountability Office (GAO). Medicare Part B imaging services: rapid spending growth and shift to physician offices indicate need for CMS to consider additional management practices. Washington (DC): U.S. Government Accountability Office (GAO); 2008 Jun. 49 p.

Extent of Measure Testing

The measures in this set are being made available without any prior formal testing. However, many of the measures in this set (Utilization of a Standardized Nomenclature for CT Imaging Description, Count of Potential High Dose Radiation Imaging Studies: Computed Tomography (CT) and Cardiac Nuclear Medicine Studies, CT Images Available for Patient Follow-Up and Comparison Purposes, Search for Prior CT Studies through a Secure, Authorized, Media-free, Shared Archive, Appropriateness: Follow-up CT Imaging for Incidentally Detected Pulmonary Nodules According to Recommended Guidelines and Reporting to a Radiation Dose Index Registry) have been in use in the Centers for Medicare and Medicaid Services (CMS) Physician Quality Reporting System program since 2013 indicating the feasibility of collecting the data elements required for measure calculation.

The American College of Radiology (ACR) recognizes the importance of thorough testing all of its measures and encourages ongoing robust testing of the Optimizing Patient Exposure to Ionizing Radiation measurement set for feasibility and reliability by organizations or individuals positioned to do so. The ACR will welcome the opportunity to promote such testing of these measures and to ensure that any results available from testing are used to refine the measures on an ongoing basis.

Evidence for Extent of Measure Testing

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPIA®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Ambulatory/Office-based Care

Ambulatory Procedure/Imaging Center

Emergency Department

Hospital Inpatient

Hospital Outpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Individual Clinicians or Public Health Professionals

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

All ages

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Not within an IOM Care Need

IOM Domain

Not within an IOM Domain

Data Collection for the Measure

Case Finding Period

Unspecified

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Diagnostic Evaluation

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions

All computed tomography (CT) imaging reports for all patients, regardless of age

Exclusions

Unspecified

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions

Computed tomography (CT) imaging reports with the imaging study named according to a standardized nomenclature and the standardized nomenclature* is used in institution's computer systems, including but not limited to:

- Computerized physician ordering system
- Charge master
- Radiology information system
- Electronic health record

*Use of a standardized nomenclature is meant to enable reporting to a Dose Index Registry. There is no standard lexicon implemented across the board for naming CT exam procedures. To make like comparisons of sites reporting dose index data to a registry, it is necessary to use a specific CT exam name and standardize that across registry participants.

Exclusions

Unspecified

Numerator Search Strategy

Fixed time period or point in time

Data Source

Administrative clinical data

Documentation of organizational self-assessment

Registry data

Type of Health State

Does not apply to this measure

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a higher score

Allowance for Patient or Population Factors

not defined yet

Standard of Comparison

not defined yet

Identifying Information

Original Title

Measure #2: utilization of a standardized nomenclature for computed tomography (CT) imaging description.

Measure Collection Name

Optimizing Patient Exposure to Ionizing Radiation Performance Measurement Set

Submitter

American College of Radiology - Medical Specialty Society

Developer

American College of Radiology - Medical Specialty Society

Physician Consortium for Performance Improvement® - Clinical Specialty Collaboration

Funding Source(s)

Unspecified

Composition of the Group that Developed the Measure

Optimizing Patient Exposure to Ionizing Radiation Work Group Members

Milton J. Guiberteau, MD (*Co-chair*) (nuclear radiology/diagnostic radiology)
David Seidenwurm, MD (*Co-chair*) (neuroradiology/pediatric and diagnostic radiology)
Dennis M. Balfe, MD (diagnostic radiology)
Dorothy Bulas, MD (pediatric radiology)
Philip N. Cascade, MD (cardiothoracic radiology)
C. Daniel Johnson, MD, MS, MMM (GI radiology)
Richard L. Morin, PhD (radiologic physics)
Robert D. Rosenberg, MD (diagnostic radiology)
Howard Sandler, MD, MS (physics) (radiation oncology)
Rebecca Smith-Bindman, MD (diagnostic radiology)
Christopher Wyatt, MHM (payer representative)

Advisory Group Members

Scott Jerome, DO (cardiology/internal medicine)
Paul M. Knechtges, MD (diagnostic radiology)
John R. Maese, MD (internal medicine/geriatrics)
Jason Sheehan, MD, PhD (neurosurgery)
Paul R. Sierzenski, MD, RDMS (emergency medicine)
Liana Watson, DM, RT(R)(M)(S)(BS), RDMS, RVT (radiography/sonography)
Sjirk J. Westra, MD (pediatric radiology)

Work Group Staff

American Board of Medical Specialties: Richard Hawkins, MD; Sheila Lazier; Katie Small; Robin Wagner, RN, MHSA; Kevin Weiss, MD, MPH

American Board of Radiology: Gary Becker, MD; Jennifer Bosma, PhD; Paul Wallner, DO

American College of Radiology: Judy Burleson, MHSA

American Medical Association: Mark Antman, DDS, MBA; Elvia Chavarria, MPH; Anu Gupta, JD; Kendra Hanley, MS; Samantha Tierney, MPH

American Medical Association-convened Physician Consortium for Performance Improvement (PCPI)
Consultant: Rebecca Kresowik

Financial Disclosures/Other Potential Conflicts of Interest

None of the members of the Patient Optimizing Patient Exposure to Ionizing Radiation Work Group had any disqualifying material interests under the Physician Consortium for Performance Improvement (PCPI) Conflict of Interest Policy.

Measure Initiative(s)

Physician Quality Reporting System

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2016 Jan

Measure Maintenance

This measure set is reviewed and updated every 3 years

Date of Next Anticipated Revision

2017

Measure Status

This is the current release of the measure.

Measure Availability

Source available from the [American College of Radiology \(ACR\) Web site](#) .

For more information, contact ACR at 1891 Preston White Drive, Reston, VA 20191; Phone: 703-648-8900; E-mail: info@acr.org; Web site: www.acr.org .

NQMC Status

This NQMC summary was completed by ECRI Institute on November 4, 2015. The information was verified by the measure developer on December 29, 2015.

Copyright Statement

This NQMC summary is based on the original measure, which is subject to the measure developer's copyright restrictions.

©2014 American Board of Medical Specialties, American College of Radiology and American Medical Association. All Rights Reserved. CPT® Copyright 2004-2013 American Medical Association.

Production

Source(s)

American Board of Medical Specialties (ABMS), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPI®), American College of Radiology (ACR). Optimizing patient exposure to ionizing radiation performance measurement set. Reston (VA): American College of Radiology; 2016 Jan. 51 p. [53 references]

Disclaimer

NQMC Disclaimer

The National Quality Measures Clearinghouse® (NQMC) does not develop, produce, approve, or endorse the measures represented on this site.

All measures summarized by NQMC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public and private organizations, other government agencies, health care organizations or plans, individuals, and similar entities.

Measures represented on the NQMC Web site are submitted by measure developers, and are screened solely to determine that they meet the [NQMC Inclusion Criteria](#).

NQMC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or its reliability and/or validity of the quality measures and related materials represented on this site. Moreover, the views and opinions of developers or authors of measures represented on this site do not necessarily state or reflect those of NQMC, AHRQ, or its contractor, ECRI Institute, and inclusion or hosting of measures in NQMC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding measure content are directed to contact the measure developer.